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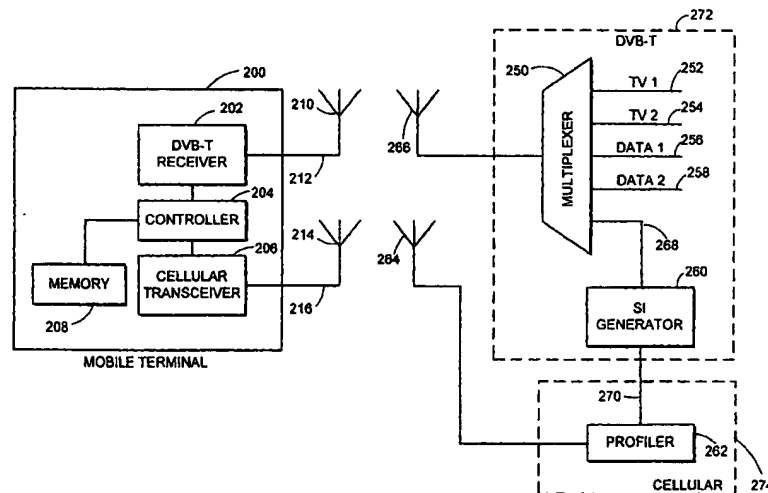
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(54) Title: A RECEIVER



(57) Abstract: The present invention relates to receivers such as multi-carrier and cellular receivers. Cellular receivers, in the form of portable radiotelephones are commonplace, and their design and operation is well understood. Such portable radiotelephones can be used for making and receiving telephone calls, sending and receiving messages, and even browsing world-wide computer network such as the Internet. Many standards exist for portable radiotelephones, including global system for mobile communications (GSM), general radio packet service (GPRS) Receivers capable of receiving digital television signals, such as signals according to the terrestrial digital video broadcasting (DVB-T) standard are also commonplace. The present invention provides a method and apparatus for receiving and transmitting signals via multiple communication channels.

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## A RECEIVER

The present invention relates to receivers such as multi-carrier and cellular receivers.

- 5 Cellular receivers, in the form of portable radiotelephones are commonplace, and their design and operation is well understood. Such portable radiotelephones can be used for making and receiving telephone calls, sending and receiving messages, and even browsing world-wide computer network such as the Internet. Many standards exist for portable  
10 radiotelephones, including global system for mobile communications (GSM), general radio packet service (GPRS)

Receivers capable of receiving digital television signals, such as signals according to the terrestrial digital video broadcasting (DVB-T) standard are  
15 also commonplace.

The use and operation of consumer set-top-boxes (STB) for receiving digital video broadcasting (DVB-T) transmissions are well known. Such STBs are capable of receiving a large number of digital television channels, data and  
20 other interactive services.

According to a first aspect of the present invention, there is provided a terminal having a first receiver for receiving an encrypted first signal from a first communications network comprising: a second receiver for receiving from  
25 a second communications network a second signal conveying information enabling said encrypted signal to be decrypted.

Advantageously, the present invention provides a receiver having a first and a second receiver for receiving signals from two different communications  
30 networks. In a first embodiment of the present invention this results in increased power efficiency, since one of the receivers can be effectively

switched off whilst not required. Schedule or configuration data can, however, still be received on the other receiver. The received schedule or configuration data can be used to switch on the other receiver at an appropriate time. This configuration allows the receiver to receive non-scheduled data, such as news  
5 flashes, results from sporting events, share prices etc.

In a second embodiment of the present invention, a receiver is able to receive a broadcast signal via a broadcast network, and to receive additional and complementary information thereto via a second telecommunications network.  
10 This is particularly advantageous in security applications, where security keys and other private or sensitive data may be sent via a more private telecommunications network. For example, if a pay-per-view film is being broadcast in encrypted form, the security keys needed to decrypt the film may be sent via the second telecommunications network. This prevents the  
15 security keys from unauthorised access of the broadcast network.

According to a second aspect of the present invention, there is provided apparatus for transmitting an encrypted signal on a first communications network, comprising: a transmitter for transmitting on a second  
20 communications network information enabling said encrypted signal to be decrypted.

According to a third aspect of the present invention, there is provided a method of receiving an encrypted first signal from a first communications  
25 network comprising: receiving from a second communications network a second signal conveying information enabling said encrypted signal to be decrypted; and decrypting said encrypted first signal using said received information.

30 According to a fourth aspect of the present invention, there is provided a method of transmitting an encrypted signal on a first communications

network, comprising: transmitting on a second communications network information enabling said encrypted signal to be decrypted.

- 5 According to a fifth aspect of the present invention, there is provided a terminal having a first receiver for receiving a first signal from a first communications network comprising: a second receiver for receiving a second signal conveying complementary information relating to said first signal from a second communications network.
- 10 According to a sixth aspect of the present invention, there is provided Apparatus for transmitting a signal to a receiver via a first communications network comprising: a transmitter for transmitting complementary information relating to said signal via a second communication network.
- 15 According to a seventh aspect of the present invention, there is provided a method of receiving a first signal from a first communications network comprising: receiving a second signal conveying complementary information relating to said first signal from a second communications network.
- 20 According to a eighth aspect of the present invention, there is provided A method of transmitting a signal to a receiver via a first communications network comprising: transmitting complementary information relating to said signal via a second communication network.
- 25 The invention will now be described, by way of example only, with reference to the accompanying diagrams, in which:
- Figure 1 is a block diagram of a typical consumer receiver/transmitter arrangement;
- 30 Figure 2 is a block diagram of a first embodiment according to the present invention; and

Figure 3 is a block diagram of yet a further embodiment according to the present invention.

Figure 1 is a block diagram of a typical consumer receiver/transmitter arrangement in which a terrestrial digital video broadcasting (DVB-T) transmitter 150 transmits a DVB-T signal to a DVB-T set-top-box receiver 106.

In the transmitter 150, a number of television channels 154 and 156 are multiplexed together with a number of data channels 158 and 160 by a multiplexer 152. In addition to this, service information (SI) 162, which contains details of each of the other multiplexed channels, is also input to the multiplexer 152, provided by a SI generator 164. The multiplexer creates a single, multiplexed, signal 166 which contains all of the separate channels 154, 156, 158 and 160, along with the SI 162. Further details of the multiplexing and SI may be found in the DVB-T specification (EN 300 468) which is incorporated herein by reference. The multiplexed signal 166 is transmitted via an antenna 164, across a transmission channel, to an antenna 102 of a set-top-box receiver 106. In the case of DVB-T, the transmission channel is a terrestrial transmission channel. However, the transmission channel could, alternatively, be a satellite, microwave, cable or optical channel.

The signals received by the antenna 102 are input to a DVB-T receiver 100 which enables the user to select a desired channel. Received data may also be stored in a memory 104.

Whilst the set-top-box 106 is switched on, the DVB-T receiver 100 is also powered up and receiving DVB-T signals. The DVB-T receiver is constantly decoding SI information which provides details of the content and location of each of the channels within the received multiplexed signal. The SI information also contain schedule details for each of the multiplexed channels. The schedule details allow a user to watch or record a specific

programme of interest. For example, if the set-top-box 106 is connected to a personal computer (not shown), it is possible to receive data transmitted over the DVB-T network for use with the personal computer. In this way, the transmission of large data files can be broadcast, to a large audience, using the high data rates provided by DVB-T transmission. If a data file is due to be transmitted at a certain time on a certain channel, the SI information will contain this information which can be used by the personal computer to ensure that receiver receives the required data.

SI information may change frequently, to reflect not only changes in program scheduling, but also to reflect re-allocation of frequencies and channels etc by the broadcaster. For example, it is possible for a channel to broadcast on a different frequency to originally scheduled. Since the SI contains details of the frequencies (or changes to the frequencies), a receiver should always be able to receive the desired channel and/or program. Some set-top-boxes store SI information in a memory, thereby allowing users to browse a schedule or program guide. However, due to the nature of SI information, the SI information is updated frequently to ensure that no discrepancies exist between the SI stored by the set-top-box and the SI being transmitted by the broadcaster.

Figure 2 shows a block diagram of a first embodiment according to the present invention. A mobile terminal 200 receives DVB-T transmissions from a DVB-T transmitter 272. The transmitted DVB-T signal is a multiplexed signal produced by a multiplexer 250. The multiplexer 250 accepts as inputs a number of channels 252, 254, 256 and 258 to produce the multiplexed signal. The channels may be television, audio or data channels. Service information (SI) data, which contains details of the multiplexed channels, is also input to the multiplexer 250. The SI data is generated by a SI generator 260, which may be a database containing schedule and location details of each of the channels.

The DVB-T signals are received by an antenna 210 of the mobile terminal 200 and are received and decoded by a DVB-T receiver 202.

In addition, and advantageously, the mobile terminal also receives an  
5 interactive channel from a cellular or other transmission network 274 at a cellular transceiver 206. The cellular transceiver 206 allows both the reception and transmission of signals between the mobile terminal 200 and the cellular network 274. The cellular network may be a GSM network, a general packet radio service (GPRS), third generation (3G) or other suitable  
10 network.

SI data generated by the SI generator 260 is also supplied to a profiler 262 of the cellular network 274. The profiler contains a database of information about each of the subscribers to the cellular network 274. The profiler may contain  
15 information such as, demographic data, income level, sports leisure interests, etc.

The operation of a first embodiment of the present invention will now be described by way of example.

20

According to the prior art, if a user wishes to receive a video clip each time his favourite football team scores during a football match, it is necessary that the DVB-T receiver 100 in the DVB-T set-top-box 106 is constantly powered up and is constantly receiving SI data. This is since the exact timing of when a  
25 goal will be scored is not known in advance. Accordingly, no schedule will exist in the SI data for this event. A DVB-T receiver must therefore wait for the SI data to indicate when the video clip will be broadcast. If the user is only interested in receiving video clips of the football match, this is particularly inefficient in terms of power consumption, especially for mobile terminals,  
30 since the DVB-T receiver just waiting, consuming power, for a specific video clip to be broadcast.



According to a first embodiment of the present invention, as exemplified in Figure 2, the subscriber registers his interest in receiving video clips with the profiler 262 of the cellular network 274. The DVB-T receiver 202 of the mobile terminal 200 may then be powered down. When a goal is scored, and a video clip is available for broadcast, the broadcaster must schedule the video clip to be included in the existing DVB-T multiplex signal. This may involve rescheduling existing programs, and updating the SI data accordingly. Once a scheduled time has been established for the broadcast of the video clip, a service announcement is sent by the cellular network 274 to the cellular transceiver 206. The service announcement is received by the cellular transceiver 206 and is processed by the controller 204. The controller informs the DVB-T receiver 202 of when the video clip will be broadcast and other relevant associated data, such as channel location, encryption parameters etc. The DVB-T receiver can be powered up and configured in time to receive and decode the video clip. The video clip may also be stored in a memory 208. Once the desired video clip, or other data, has been received, the DVB-T receiver 202 can be once again powered down.

The service announcement may be in the form of SI data, or may alternatively be in the form of a special short message service (SMS) message containing the necessary timing and location information required by the DVB-T receiver. Alternative forms of service announcement may be used, both in terms of the data required to be sent and the protocol which is used for sending it.

In this way, the DVB-T receiver 202 can be powered down when not required for actual reception of data. This can produce large savings in power consumption, compared to the system of the prior art.

The profiler 262 also controls whether requested information is transmitted to a user via the DVB-T or cellular network. For example, if one million people have requested to see a video clip of goals from a particular football match, it is better to transmit the video clip via the DVB-T network. For such a large

number of users, the DVB-T network provides a cost effective delivery means. The alternative would be to individually send the video clip via the cellular network which, with so many users, could impact severely on the operation of the cellular network.

5

If the number of users requesting to see a particular video clip is much smaller, it may be more economical to send it individually via the cellular network. The exact threshold levels will vary according to the pricing structure of the DVB-T and cellular networks, as well as the number of users requesting  
10 a particular item, and the volume of data required to be sent.

The cellular transceiver 206 may also be used to send an acknowledgement back to the cellular network 274, indicating whether the video clip was correctly received. This may be used for billing purposes, or also to request a  
15 re-sending of the video clip if it not received due to poor signal strength etc. Re-sending of the video clip may again take place either via the DBV-T or cellular network depending on demand and cost effectiveness.

A further advantage of the present invention is that, if schedule  
20 announcements are sent over the cellular network, it is possible to remove some or all of the SI data from DVB-T network. Since the SI data typically occupies up to  $3\text{Mbits}^{-1}$  this redundant bandwidth could be used for providing additional data or video channels.

25 In a further embodiment of the present invention, a profiler may be included in the mobile terminal 200. This may be instead of, or in addition to, the profiler 262 of the cellular network 274. A profiler on the mobile terminal may be used if the communications network used for the interactive channel supports broadcasting of data, such as via a GPRS network or other packet type  
30 network. The profiler can be configured according to user preferences, and will only accept service announcements which comply with the user preferences.

Figure 3 shows yet a further embodiment of the present invention, which makes use of the additional interactive channel to provide increased security.

A mobile terminal 300, receives DVB-T signals via an antenna 310 at a DVB-T receiver 302. The DVB-T signals are provided and transmitted by a DVB-T network 320, via an antenna 330. The mobile terminal 300 also comprises a cellular transceiver 306 which can send and receive calls via a cellular network 326. The mobile terminal 300 also comprises a controller 304 which can either send or receive control information from the cellular transceiver 306, the DVB-T receiver 300 or a memory 308. A controller 324 is also provided to provide communication and control between the DVB-T network 320 and the cellular network 326.

This embodiment enables DVB-T data to be broadcast from the DVB-T network 320 to the mobile terminal 300. In addition, data related to the broadcast DVB-T signal may also be transmitted to the mobile terminal 300 via the cellular network 326.

For example, at present, when encrypted video or television channels are broadcast to a terminal, security keys are also broadcast over the broadcast channel to enable subscribers to decrypt the encoded data. Although the security keys are hidden in the broadcast signal, it is possible for unauthorised users to gain access to these keys by monitoring the broadcast signals. Using the present invention, the security keys or security data can be sent over the interactive channel, directly to each individual receiver. This makes it increasingly difficult for unauthorised users to obtain access to the security keys, since they are sent via a different path to the encrypted video signals. The security keys may be sent for either currently broadcast signals, or for broadcast signals which have yet to be broadcast. In a still further embodiment, the terminal 300 comprises a subscriber information module (SIM) (not shown) which may contain authorisation or additional security data for use with either the cellular or DVB networks. The authorisation or

additional security data contained by the SIM may be used in conjunction with the security data to enable authorisation or decryption of the signals received via the broadcast network.

- 5 In a still further embodiment of the present invention, on-line banking and other customer orientated services can use the present invention to improve the transmission of data, including Internet pages, to subscribers. For example, an on-line bank could broadcast using the DVB-T network pages of information containing high quality graphics, standard texts etc. Each page  
10 could then be personalised using personal data transmitted over the interactive channel. For example, a generic 'balance' sheet could be broadcast to all users containing the bank logo, background images etc. Personal balance data transmitted over the interactive channel could then be combined with the broadcast 'balance' sheet, to present to the user their own  
15 personal balance sheet.

The present invention therefore provides benefits not only in increase power efficiency of such systems, but also provides added security and benefits of being able to broadcast information to multiple users, and to send subscriber  
20 specific information related to that broadcast information using a separate, personal, communications link. In yet a further embodiment of the present invention, the interactive channel can be used for both transmitting service announcements as well as security or private data.

- 25 Those skilled in the art will appreciate that although the present invention is described above with reference to DVB-T transmissions, the invention is not limited thereto. The same techniques could be applied to DVB (satellite) reception and transmission or any other similar or equivalent standards. Equally, references to cellular networks and cellular transmission techniques  
30 could be replaced by fixed line, public switched telephone networks, or any other type of suitable communications network.

**CLAIMS**

1. A terminal having a first receiver for receiving an encrypted first signal from a first communications network comprising:  
5 a second receiver for receiving from a second communications network a second signal conveying information enabling said encrypted signal to be decrypted.
- 10 2. A terminal according to claim 1, further comprising a subscriber identification module (SIM) containing security data for use in conjunction with said second signal for enabling said encrypted first signal to be decrypted.
- 15 3. A terminal according to claim 1 or 2, wherein said encrypted first signal is a digital video broadcasting signal (DVB) signal, and said first receiver is a digital video broadcasting (DVB) signal.
- 20 4. A terminal according to claim 1, 2 or 3, wherein said second signal is a global system for mobile (GSM) signal, and said second receiver is a global system for mobile (GSM) receiver.
- 25 5. A terminal according to claim 1, 2 or 3, wherein said second signal is a general packet radio service (GPRS) signal, and said second receiver is a general packet radio service (GPRS) receiver.
- 30 6. A terminal having a first receiver for receiving an encrypted first signal from a first communications network comprising:  
a second receiver for receiving from a second communications network a second signal conveying information enabling said encrypted signal to be decrypted and further comprising a subscriber identification module (SIM)

containing security data for use in conjunction with said second signal for enabling said encrypted first signal to be decrypted.

7. Apparatus for transmitting an encrypted signal on a first communications  
5 network, comprising:  
a transmitter for transmitting on a second communications network  
information enabling said encrypted signal to be decrypted.
8. Apparatus according to claim 7, wherein said encrypted signal is a digital  
10 video broadcasting (DVB) signal, and said first communications network  
is a digital video broadcasting (DVB) network.
9. Apparatus according to claim 7 or 8, wherein said second communications  
15 network is a global system for mobile (GSM) network, and said transmitter  
is a global system for mobile (GSM) transmitter.
10. Apparatus according to claim 7 or 8, wherein said second communications  
network is a general packet radio service (GPRS) network, and said  
20 transmitter is a general packet radio service (GPRS) transmitter.
11. A method of receiving an encrypted first signal from a first communications  
network comprising:  
receiving from a second communications network a second signal  
conveying information enabling said encrypted signal to be decrypted;  
25 and  
decrypting said encrypted first signal using said received information.
12. A method according to claim 11, further comprising using security data  
stored on a subscriber identification module (SIM) in conjunction with said  
30 second signal for decrypting said encrypted first signal.

- 13.A method according to claim 11 or 12, comprising transmitting said signal as a digital video broadcasting (DVB) signal.
- 14.A method according to claim 11, 12 or 13, comprising transmitting said  
5 complementary information via a global system for mobile (GSM) network.
- 15.A method according to claim 11, 12 or 13, comprising transmitting said complementary information via a general packet radio service (GPRS) network.  
10
- 16.A method of receiving an encrypted first signal from a first communications network comprising:  
receiving from a second communications network a second signal conveying information enabling said encrypted signal to be decrypted; and  
15 decrypting said encrypted first signal using said received information and security data retrieved from a subscriber identification module (SIM).
- 17.A method of transmitting an encrypted signal on a first communications network, comprising:  
20 transmitting on a second communications network information enabling said encrypted signal to be decrypted.
- 18.A method according to claim 17, comprising transmitting said signal as a digital video broadcasting (DVB) signal.  
25
- 19.A method according to claim 17 or 18, comprising transmitting said complementary information via a global system for mobile (GSM) network.
- 20.A method according to claim 17 or 18, comprising transmitting said  
30 complementary information via a general packet radio service (GPRS) network.

21. A method of transmitting a signal to a receiver via a first communications network comprising transmitting complementary information relating to said signal via a second communications network, wherein said first signal contains public data and said complementary information contains personal data.

22. A method of receiving a first signal from a first communications network comprising receiving a second signal conveying complementary information relating to said first signal from a second communications network, and combining said information from said second signal with content in said first signal.

23. A method as claimed in Claim 22, wherein said complementary information comprises personal data, said data being combined with generic data forming said content of said first signal.

24. A method as claimed in Claim 22 or Claim 23, wherein said second signal further comprises schedule and configuration data relating to said first signal identifying said content.

25. A terminal having a first receiver for receiving a first signal from a first communications network comprising:  
a second receiver for receiving a second signal conveying complementary information relating to said first signal from a second communications network.

26. A terminal according to claim 25, further comprising a controller for configuring said first receiver according to said complementary information.



27. A terminal according to claim 25 or 26, wherein said first receiver is enabled to receive said first signal in response to said complementary information.

5 28. A terminal according to claim 25, 26 or 27, wherein said complementary information comprises schedule and configuration data.

29. A terminal according to any one of claims 25 to 28, further comprising storage means for storing user preferences.

10

30. A terminal according to claim 29, further comprising decision means for deciding whether said second signal should enable said first receiver in dependence on the stored user preferences.

15 31. A terminal according to any of claims 25 to 30, wherein said first signal is a digital video broadcasting (DVB) signal, and said first receiver is a digital video broadcasting (DVB) receiver.

20 32. A terminal according to any of claims 25 to 31, wherein said second signal is a global system for mobile (GSM) signal, and said second receiver is a global system for mobile (GSM) receiver.

25 33. A terminal according to any of claims 25 to 31, wherein said second signal is a general packet radio service (GPRS) signal, and said second receiver is a general packet radio service (GPRS) receiver.

30 34. Apparatus for transmitting a signal to a receiver via a first communications network comprising:  
a transmitter for transmitting complementary information relating to said signal via a second communication network.

35. Apparatus according to claim 34, wherein said complementary information comprises schedule and configuration data relating to said first signal.
36. Apparatus according claim 34 or 35, further comprising storage means for  
5 storing details of subscriber preferences.
37. Apparatus according to claim 36, further comprising decision means for deciding to which subscribers to transmit said second signal in dependence on said stored subscriber preferences.
- 10 38. Apparatus according to any of claims 34 to 37, wherein said first signal is a digital video broadcasting (DVB) signal, and said first communications network is a digital video broadcasting (DVB) network.
- 15 39. Apparatus according to any of claims 34 to 38, wherein said second communications network is a global system for mobile (GSM) network, and said transmitter is a global system for mobile (GSM) transmitter.
- 20 40. Apparatus according to any of claims 34 to 38, wherein said second communications network is a general packet radio service (GPRS) network, and said transmitter is a general packet radio service (GPRS) transmitter.
- 25 41. A method of receiving a first signal from a first communications network comprising:  
receiving a second signal conveying complementary information relating to said first signal from a second communications network.
- 30 42. A method according to claim 41, further comprising receiving said first signal in accordance with said complementary information.

43.A method according to claim 41 or 42, further comprising storing user preferences.

44.A method according to claim 43, further comprising deciding whether said  
5 second signal should be received in dependence on said stored user preferences.

45.A method of transmitting a signal to a receiver via a first communications network comprising:  
10 transmitting complementary information relating to said signal via a second communication network.

46.A method according to claim 45, wherein the step of transmitting complementary information comprises transmitting schedule and  
15 configuration data relating to said signal.

47.A method according to claim 45 or 46, further comprising storing details of subscriber preferences.

20 48.A method according to claim 47, further comprising deciding whether to transmit said complementary information to a subscriber in dependence on said stored preferences.

49.A method according to any of claims 45 to 48, comprising transmitting said  
25 signal as a digital video broadcasting (DVB) signal.

50.A method according to any one of claims 45 to 49, comprising transmitting said complementary information via a global system for mobile (GSM) network.

51. A method according to any one of claims 45 to 49, comprising transmitting said complementary information via a general packet radio service (GPRS) network.
- 5 52. A system for transmitting and receiving according to any preceding claim.
53. A terminal substantially as hereinbefore described with reference to the accompanying drawings.
- 10 54. Apparatus for transmitting a signal substantially as hereinbefore described with reference to the accompanying drawings.
55. A method of receiving substantially as hereinbefore described with reference to the accompanying drawings.
- 15 56. A method of transmitting substantially as hereinbefore described with reference to the accompanying drawings.

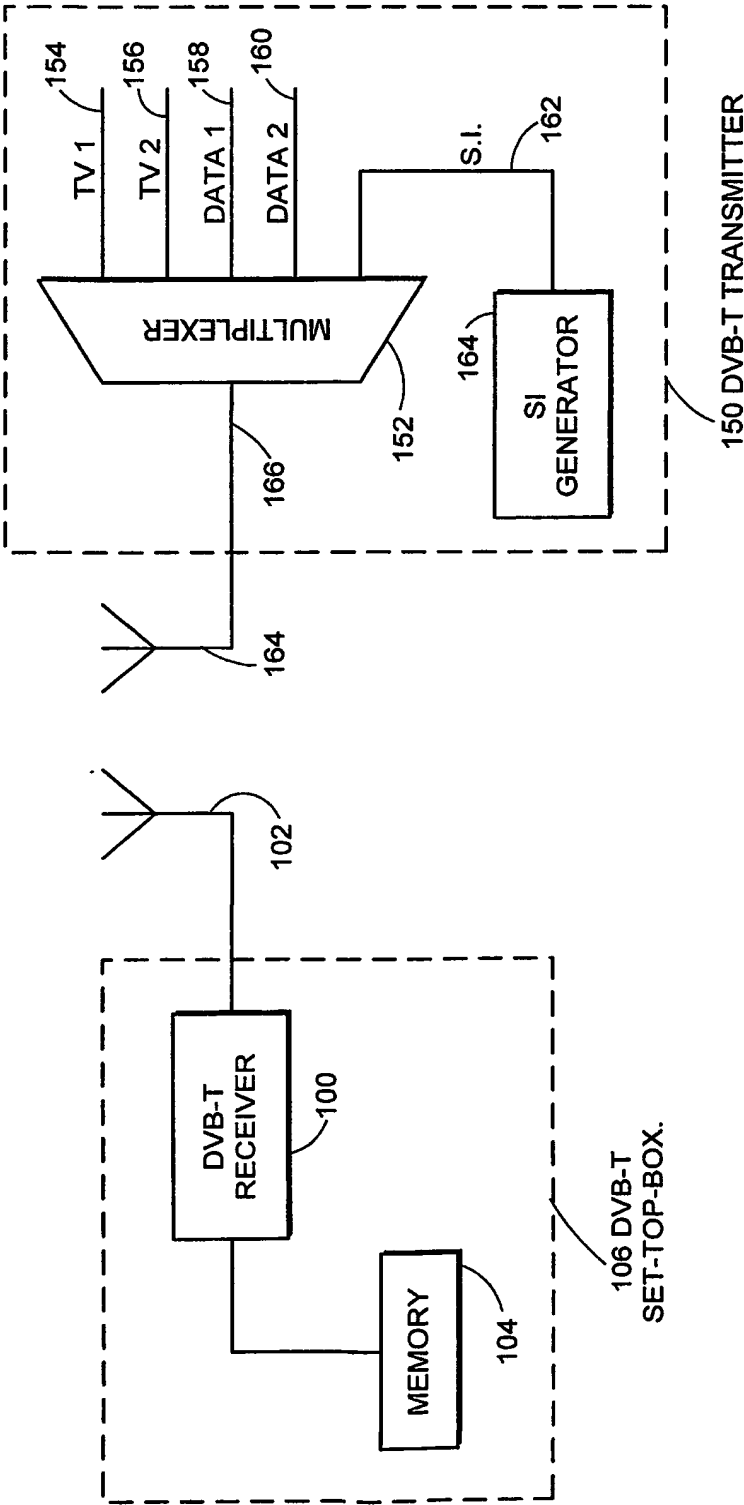


FIG.1 PRIOR ART

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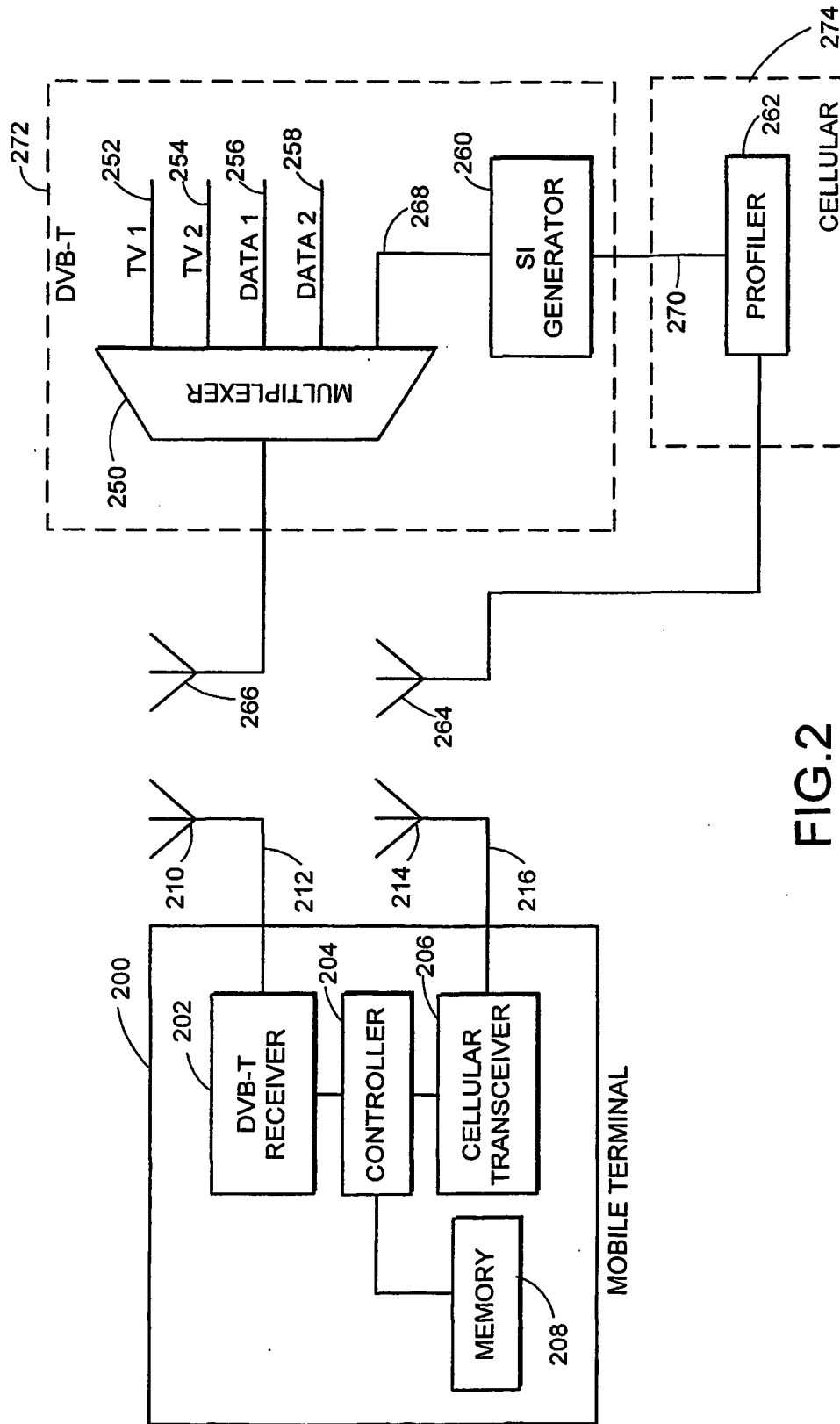


FIG.2

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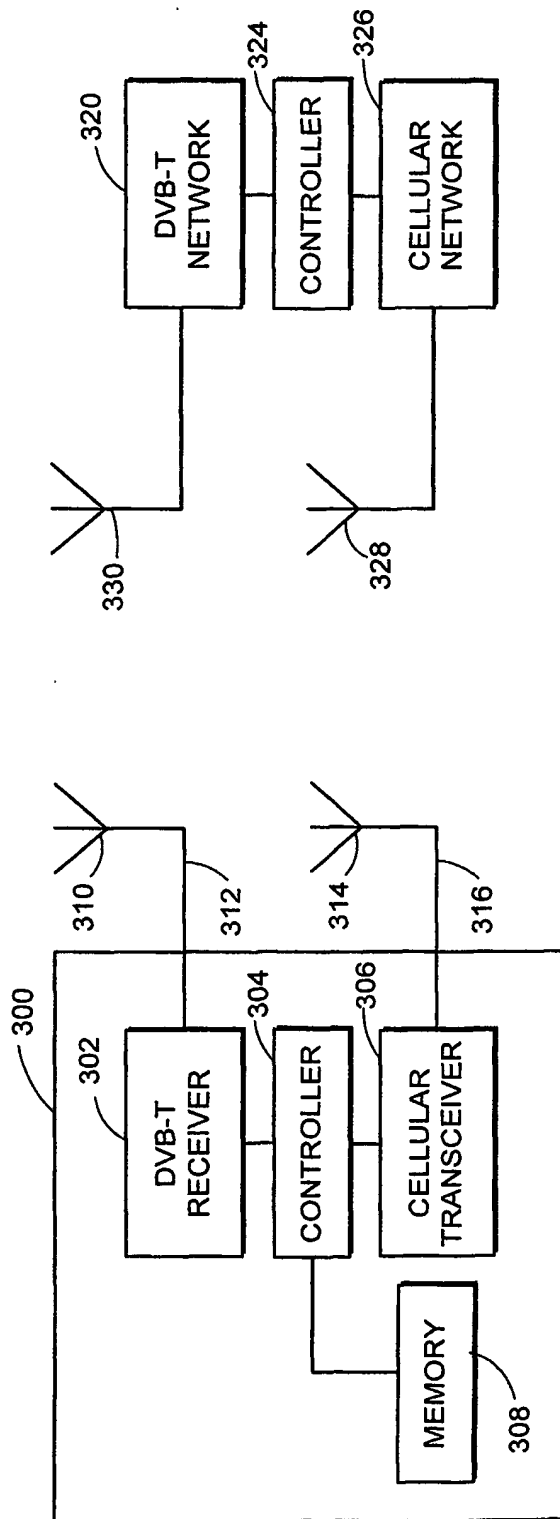


FIG.3

# INTERNATIONAL SEARCH REPORT

Inte 1st Application No

PCT/EP 01/07239

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q7/22 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 822 324 A (KOSTRESTI BRUCE ET AL) 13 October 1998 (1998-10-13)	1,7,11, 17,21, 22,25, 34,41, 45,52-56
Y	abstract  column 1, line 20 - line 29 column 5, line 48 - line 52 column 8, line 7 - column 9, line 65 figures 4,7  --  -/-	2-6, 8-10, 12-16, 18-20, 23,24, 26-33, 35-40, 42-44, 46-51

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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PCT/EP 01/07239

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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